

THE CAPACITY OF THE ATMOSPHERE AND OCEAN TO PROCESS CARBON DIOXIDE IS LIMITED.

The architects of climate policy have assumed a relationship between the reduction of fossil fuel emissions and the carbon dioxide content of the atmosphere.

That assumption is false, at least in the short and medium term.

Based on that assumption, climate policy is focussed on reducing fossil fuel emissions to the 1990 or 2000 level as if the atmosphere then had the capacity to process all the fossil fuel emissions it was receiving.

That assumption is also false.

They both assume that fossil fuel emissions and the carbon dioxide content of the atmosphere are the main variables involved in the global carbon dioxide cycle. They are not.

The greatest carbon dioxide reservoir on earth is the ocean,

The ocean contains more carbon dioxide than atmosphere, soil and the vegetation combined. Carbon dioxide flows continuously from the atmosphere into the ocean across the air-sea interface. This means that most of the fossil fuel emissions that have been discharged into the atmosphere since the beginning of the Industrial Revolution are now dissolved in the ocean.

That is why the ocean has become more acid.

The consequence of this “imbalance” is that reduced fossil fuel emissions will not immediately reduce the carbon dioxide concentration of the atmosphere. All that will happen is that more carbon dioxide will flow back from the ocean into the atmosphere until its historical “carbon debt” has been repaid.

The atmosphere has “loaned” carbon dioxide to the ocean.

Just as land has a limited grazing capacity for stock, so the atmosphere has a limited “carrying capacity” for carbon dioxide. What makes the situation so dire is that the ocean also has a limited carrying capacity, because carbon dioxide gas is less soluble in warm seas than cold. That is why high latitude oceans are now more acid than low latitude oceans. When the global greenhouse begins to overheat and the ocean begins to warm, the flow of dissolved carbon dioxide into the atmosphere across the sea-air interface gets even stronger still.

In simple terms, this means that warming reinforces warming.

This vicious positive feedback process has close parallels in economics, for example the panic-induced “global meltdown”. So, the key question that climate policy needs to address is “how long will carbon dioxide continue to flow back into the atmosphere before a steady state is reached?” That is, how long will it take the ocean to repay its carbon debt? Then, and only then, will greenhouse warming abate. This is a time lag question involving the “residence time” or “turnover time” of carbon dioxide in the ocean...

Unfortunately the residence time of carbon dioxide in the ocean is of the order of one millennium because it takes that long for the surface waters of the ocean to circulate through the ocean deeps and emerge once again at the surface at “upwellings”. That constitutes a carbon sequestration process with a millennial time fuse. However, the surface layer of the ocean is not so constrained. It is largely isolated from the ocean deeps by a temperature barrier (the “thermocline”), particularly in low latitudes; its dissolved carbon dioxide is now flowing back into the atmosphere.

Just as rains increase river flow causing river levels to rise, so fossil fuel emissions increase the carbon dioxide level of the atmosphere causing global temperatures to rise.

Furthermore, as seas warm in response to global warming, the temperature barrier between surface and subsurface seas becomes even stronger and dissolved carbon dioxide comes out of solution, overheating the global greenhouse. That's the crux of the problem.

There is a law in nature ("The Law of the Minimum"), which states that production is governed by the resource in shortest supply. This applies in equal measure to such fields as ecology, economics, agriculture and climate policy. However, economics tends to ignore natural limits to growth by "externalising" them, implicitly acknowledging the limitations of economics itself as a useful social tool. Nearly half the earth's photosynthetic production, for example, is now being used, either directly or indirectly, to feed human beings with the result that natural resources are becoming scarce. If that were not so, there would not be so much starvation in the world.

Whereas the population of the world was once small relative to the natural resources on which it depended, today the ratio has reversed.

Taken in context with the recent collapse of the stock market, the time has come to reconsider old certainties such as the relative merits of growth versus the steady-state. Herman Daly, the World Bank's senior environmental economist from 1994 to 1998 asks the question:

"What is growth? Is it a temporary process to arrive at a state we will want to maintain? Or is growth a process which is itself desirable and is supposed to go on forever?"

There is only one atmosphere. Carbon dioxide spreads throughout the global atmosphere in a matter of weeks, influencing rich and poor alike. Some nations emit more than others, some per capita; some have better technology; some are less affluent; and some have become affluent at the expense of others. So it became necessary at Kyoto to adopt an agreed "datum year" as the target for national emission reduction aspirations.

The challenge faced by this Inquiry is to identify a formula for reducing annual fossil fuel emissions that relates to the inherent carrying capacity of the atmosphere and ocean, rather than to an arbitrary 1990 level. Science can readily estimate how much carbon dioxide the atmosphere can take before it overheats. Perhaps the time has come for climate policy to consider the merit of steady-state economics as a means of stabilising both the global climate and the global stock market? As Daly says, "Growth is more and more of the same stuff; development is the same amount of better stuff."

Growth and development, which for far too long have been assumed to be much the same, should be decoupled. That should be the foundation of Australia's Climate Policy.